Observations of the Partial Eclipse of the Sun, 1908 December 23, at the Natal Observatory.

(*Communicated by E. Nevill, F.R.S., Government Astronomer.*)

The following observations of the partial eclipse of the Sun were obtained by Mr. A. E. Hodgson, using the 8-inch equatorial refractor in conjunction with the Merz polarising eyepiece and a magnification of 250. The Sun's limb was "boiling" violently during the time of observation.

Observed time of first contact	$1^h\ 48^m\ 40^s$
Computed time of first contact	$1^h\ 48^m{\cdot}8$
Observed time of last contact	$3^h\ 58^m\ 55^s$
Computed time of last contact	$3^h\ 59^m{\cdot}1$

The computed times are from the *Nautical Almanac* 1908, p. 453, and the time used is standard time, which is exactly two hours in advance of Greenwich time.

The method of observation was the eye and ear, and the seconds were noted by the beat of a Morse sounder in direct electrical connection with the standard mean time clock, Kullberg 5366.

No micrometer measurements were obtained, as it was considered unsafe for the webs owing to the intense heat, the Sun being almost in the zenith at the commencement of the observations, but measurements of a projected image of the Sun at the time of computed middle eclipse gave the magnitude as ·357. The computed value in the *Nautical Almanac* was ·367.

On the Data employed in Oppolzer's Canon der Finsternisse.

By E. Nevill, F.R.S.

Mr. Fotheringham is quite correct in supposing that I had misunderstood the real meaning of the empirical corrections to Hansen's Tables employed by Professor Oppolzer in his *Canon der Finsternisse*. Having copies of neither the *Canon* nor the fundamental *Syzygien Tafeln*, the data I had to use were some manuscript extracts taken during my visit to England in 1890, and these gave for the empirical corrections the values

$$\text{Correction to epoch of conjunction} = \Delta T = +0^d{\cdot}006S + 0^d{\cdot}009S^2 + 0^d{\cdot}00009S^3$$

$$\text{Correction to argument of latitude} = \Delta(g+\omega) = -0^\circ{\cdot}190S - 0^\circ{\cdot}040S^2 - 0^\circ{\cdot}00040S^3$$

$$\text{Correction to mean anomaly} = \Delta g = - + 0^\circ{\cdot}300S^2 + 0^\circ{\cdot}00300S^3$$

where S denoted thousands of years from the epoch 1800.

In default of any explanation, these were taken to represent the total corrections applied to each of these quantities, and the last two as being expressed in ordinary degrees of arc.

It was only when I obtained copies of Oppolzer's *Canon* and *Syzygien Tafeln* some two years ago that I discovered that this was not the case, and learnt that the two last corrections represented explicit extra corrections in addition to those implicitly involved in the correction ΔT; whilst I discovered, further, that though the correction $\Delta(g+\omega)$ was in sexagesimal degrees, the correction Δg was meant to be in centesimal degrees.

This misunderstanding explains the greater part of the discordance between the results for the ancient eclipses of the Sun obtained by Mr. Cowell and myself, and I have had for some time in hand an unfinished note stating this fact, and giving the amended results of my calculations, but heavy pressure of work has prevented its completion.

But it does not affect the conclusion drawn in my note on these ancient eclipses of the Sun (*M.N.*, vol. lxvi. p. 404). I was concerned to show simply that as it was possible to represent seven or eight selected eclipses out of the known thirty recorded ancient eclipses by many different sets of data, the fact that any given system of data did represent some five or six selected eclipses could not be held to establish the correctness of the assumed system. To prove this, I selected three widely different sets of data, and showed that each served to represent from six to eight of the known ancient eclipses of the Sun.

It is true that, owing to the misunderstanding of Oppolzer's meaning, the actual data corresponding to these calculations were not those specified in the note, but corresponded to approximately secular accelerations of the perigee and node about $3''\cdot7$ and $2''\cdot6$ larger than stated; but this in no way invalidated the conclusion drawn, that the mere fact that any adopted system of data served to represent some seven or eight of the recorded ancient eclipses of the Sun was no proof of the accuracy of the assumed data. The very mistake made only strengthens this conclusion.

At the same time, the results I obtain for the true values of Oppolzer's assumed data do not quite accord with those found by Mr. Fotheringham. I make the data to be

Corrections to Hansen's Tables.

Correction to mean longitude $= +0''\cdot00 - 26''\cdot33T - 3''\cdot574T^2 - 3''\cdot574\left(\frac{T}{10}\right)^3$

Correction to longitude of Perigee $= +0''\cdot00 - 0''\cdot24 - 11''\cdot084 - 11''\cdot748$

Correction to longitude of Node $= -5''\cdot50 + 79''\cdot52 + 1''\cdot011 + 0''\cdot922$

corresponding to secular accelerations,

In mean longitude $= +8''\cdot606T^2 =$ Theory value $+ 2''\cdot70T^2$

In longitude of Perigee $= -48''\cdot339 =$,, $-9''\cdot44$

In longitude of Node $= +8''\cdot079 =$,, $+1''\cdot52$

These three values are quite inconsistent with theory, unless there is some defect in the values derived by astronomers from the theory of gravitation. It is possible that the values obtained by Professor Newcomb and Professor Brown may not be quite complete, but it seems very doubtful that they could be as much as half a second too small.

Natal Observatory:
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Note on Mr. Nevill's paper on the Data employed in Oppolzer's Canon der Finsternisse. By P. H. Cowell, M.A., F.R.S.

In the *Monthly Notices*, vol. lxvi. p. 404, Mr. Nevill examines four different sets of formulæ, and on p. 415 he arrives at the conclusion that they represent ancient eclipses about equally well, and that therefore there is no observational ground for preferring one set of formulæ to any other of the four. At that time he believed the fourth set of formulæ to be mine, and he thought that he had shown three other sets to be equally good. Mr. Fotheringham has, however, pointed out that Mr. Nevill's calculations were based on a misconception of Oppolzer's meaning, and Mr. Nevill now admits that the four sets of formulæ that he examined are different from what he supposed, and in particular that the fourth set is not mine. Assuming the accuracy of his arithmetic, he has therefore demonstrated that four sets of formulæ that have nothing to do with me represent ancient eclipses equally well, or perhaps we should say equally badly. Mr. Fotheringham's researches have presented Mr. Nevill with another set of formulæ different from mine, and coming up to a certain standard in satisfying ancient records; and as he has now four sets instead of three (not mine), he considers that his conclusion is strengthened.

It should be noticed, however, that he tacitly assumes that my formulæ do not satisfy the records any better than his four different sets; and as, by his own admission, he has not examined my formulæ at all, I am at a loss to account for this assumption. In the absence of any figures of his own, I beg of him to look at mine, and to notice that, according to my calculations, my formulæ bring the centres of the Sun and Moon to within 50″ of each other for the eclipses of −1062, −762, −648, −602, −584, −430, −309 (besides others after the beginning of the Christian era), and that therefore the residuals according to my formulæ are about one-third as large as the residuals according to any of his four sets.

I can assure him that my conclusions would never have been put forward if my residuals had really been as large as he supposed them to be when he wrote his paper of 1906 May.